

October 29, 1984

NAME: Robert James Klotzbach
AGE: 62 DATE OF BIRTH: August 27, 1922
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EDUCATION: B.S. Chemistry, Fordham University, 1943
Army Specialized Training Chemical Engineering,
New York University, 1944

PRESENT OCCUPATION: Director Technology
Umetco Minerals Corporation
Niagara Falls, NY 14302

Member of Union Carbide Corporation Technology
Committee, 1973 to Present

REPORTS TO: Vice President, Umetco Minerals Corporation

ACCOUNTABILITY R&D, specifically uranium, vanadium, tungsten, molybdenum,
copper, and chromium for domestic operations and foreign
plants in South Africa and Brazil

Engineering including foreign and domestic ferroalloy and
minerals business areas

Maximum Operating Budget \$9,000,000

Maximum Capital Budget \$40,000,000

SUPPLEMENTAL BIOGRAPHICAL DATA: Who's Who in America 1972-Present
American Men and Women of Science 1956
Who's Who in Atoms, 5th Edition

MEMBERSHIPS: Niagara Frontier Research Directors Association
American Association for the Advancement of Science
Society for the Preservation, Unification, and Redevelopment of
Niagara

Niagara Falls Country Club

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EXPERIENCE:

1984

Director of Technology, Umetco Minerals Corporation

1975-1983

Director of Technology, Metals Division, Union Carbide Corporation, Niagara Falls, NY - Reports to Vice President

Direct research, development, quality control, and engineering of mills, smelters, and plant additions processing uranium, vanadium, tungsten, molybdenum, copper, asbestos, silicon, manganese, chromium, coal, calcium carbide, and other minerals for domestic and foreign operations in 1975-1978 period. Manage Niagara Falls site for maximum of 280 people, providing analytical, mineralogy and metallographic services on a division-wide basis.

Specific Results: Process development design and construction of

1. Electric furnace charge chrome plant, Tubatse, South Africa.
2. 300 tons/day tungsten concentrate gravity mill, Boca de Lage, Brazil
3. 1000 tons/day tungsten concentrate flotation mill, Tempiute, Nevada
4. Uranium in-situ ion exchange yellow cake plant, Palangana, Texas
5. Uranium heap leach solution mining, ion exchange yellow cake plant, Craig, Colorado
6. Uranium heap leach solution mining, ion exchange yellow cake plant, Gas Hills, Wyoming.
7. 1200 tons/day vanadium magnetic concentrate roast, leach, precipitation mill, Brits, South Africa.
8. New technology vanadium carbide and vanadium nitride production facility, Bon Accord, South Africa.
9. Aqueous waste treatment facility for vanadium effluents at Hot Springs, Arkansas; ferroalloy and electrolytic effluents at Marietta, Ohio; and ferroalloy furnace effluents, Ashtabula, Ohio and Sheffield, Alabama.
10. Manganese oxygen reduction facility, Marietta, Ohio.
11. Rebuild of manganese furnace, Beauharnois, Canada

- 1975-1983
(Continued)
12. Develop and produce new vanadium carbide-tungsten carbide hardfacing products.
 13. Develop and produce proprietary asbestos products used as plastic fillers and drilling muds.
 14. Designed and built columbium concentrate pilot plant, West Congo, Africa.
- 1973-1975 Director of Technology, Mining and Metals Division, Niagara Falls, NY
- Reported to President
- Directed research, development, new product development, quality control, and engineering activities for Union Carbide's domestic and foreign mining operations and related mill processes and products.
- 1968-1973 Director of Engineering, Mining and Metals Division, Niagara Falls, NY
- Reported to General Manager
- 1965-1968 Manager of Process Engineering, Mining and Metals Division, Niagara Falls, NY
- Reported to Director of Engineering
- 1965-1973 Specific Results
1. Designed and constructed vanadium solvent extraction circuit, Uravan, Colorado.
 2. Design and construction of 1700 tons/day vanadium roast, leach, solvent extraction crystallization vanadium and oxide reduction mill, Hot Springs, Arkansas
 3. Design and installation of 120 tons/day sodium sulfate crystallization system, Bishop, California.
 4. Design and installation of 10,000 gallons/day tungsten mine effluent flocculator treatment facility, Bishop, California.
 5. Designed and installed 1000 tons/day tungsten crushing, grinding, and flotation mill expansion, Bishop, California.
 6. Developed new products and designed and constructed new facility producing manganese-aluminum; chromium-aluminum, and ferroaluminum hardeners for the aluminum industry
 7. Designed and installed wet and dry fume collectors on electric furnaces, Niagara Falls, New York; Marietta, Ohio; and Alloy, West Virginia.

1965-1968
(Continued)

8. Design and installation of tungsten metal production facility, Niagara Falls, New York.
9. Design and construction of tungsten blue oxide facility, Bishop, California

1960-1965

Manager of Engineering, Nuclear Division, Tuxedo, NY - Reported to Vice President

Specific Results

1. Design and construction of uranium leach, ion exchange yellow cake mill, Gas Hills, Wyoming.
2. Design of new technology asbestos mill, King City, California.
3. Process development design and construction of ammonium paratungstate production facility, Bishop, California.
4. Design and installation of V_2O_5 facility, Rifle, Colorado.
5. Design and installation of sulfuric acid plant, Uravan, Colorado.
6. Design and installation of uranium hot leach facility, Uravan, Colorado.
7. Design and construction of 1000 tons/day uranium acid leach, ion exchange precipitation and roasting mill, Gas Hills, Wyoming.
8. Designed 500 tons/day vanadium roast, leach, and precipitation mill, Bon Accord, South Africa.
9. Design and construction of deep sea cassiterite dredge for Thailand tin smelter
10. Design and construction of reverberatory furnaces for tin smelter, Phuket, Thailand.
11. Chairman of Union Carbide Corporation Reactor Safeguards Committee supervising and monitoring all reactor experiments, radiopharmaceutical production techniques and shipments
12. Design and construction of bulk sulfide roast, molybdenum metal, and electrolytic copper plants, Bishop, California
13. Consultant for Linde Division, Union Carbide Corporation, on installation of cryogenic loop in NASA Plumbrook reactor.

1960-1965
(Continued)

14. Responsible for Union Carbide's rejection of New York State proposal to build power reactor fuel reprocessing facility in West Valley, New York.
15. Designed irradiated Polyox Van de Graaf facility, Bound Brook, New Jersey.
16. Designed and constructed uranium lignite kiln, North Dakota
17. Designed and constructed prototype of truck mounted radon gas bore hole analyzer for exploration

1955-1960

Manager of Engineering, Nuclear Division, New York, NY -
Reported to General Manager

Specific Results

1. Designed Union Carbide's radioactive materials laboratory, Tuxedo, New York.
2. Project engineer for Pennsylvania Advanced Reactor project, a homogeneous reactor joint venture of Union Carbide, Pennsylvania Power and Light, and Westinghouse.
3. Prepared Union Carbide's Reactor Hazards Report for AEC licensing.
4. Calculated all shielding requirements for Union Carbide Corporation reactor and hot laboratory
5. Started up and redesigned large sections of Rifle, Colorado, uranium mill including roasting, leaching, quenching, off-gas and materials handling.
6. Design and constructed neutron diffraction device for Union Carbide Corporation reactor
7. Nuclear consultant for Union Carbide Development Company, Linde and Chemicals & Plastics Divisions.
8. Designed nuclear energy exhibit for lobby of Union Carbide Corporation, 270 Park Avenue office building.

1953-1955

Chairman, Long-Range Planning Chemical Technology, Oak Ridge
National Laboratory, Oak Ridge, Tennessee - Reported to Division
Director

Accountable for data evaluation, future programming, and advanced studies related to chemical processing technology connected with the Aqueous Homogeneous Reactor Program, thorium irradiation, Uranium-233 production, fission product utilization, aircraft reactor experiment, fused salt reactors and liquid metal reactor

1953-1955
(Continued) experiment. Oak Ridge representative at Brookhaven National Laboratory on 3-year liquid metal fuel reactor design with Babcock and Wilcox. Participated in studies related to Uranium-235 loading of Savannah River reactors and Hanford reactors. Worked with Nobel Prize winner, Eugene Wigner, on chemical processing study HOPE.

1949-1953 Senior Engineer, Oak Ridge National Laboratory, Oak Ridge, Tennessee - Reported to Division Director

Design engineer for process, tankage, piping, and criticality control for irradiated Uranium-235 from MTR, SIR, and STA fuel elements which is the only currently operating facility in the United States at Arco, Idaho.

Resident engineer at Foster Wheeler Corporation, New York, New York, who were architect engineers for Arco plant (1949-1950).

Resident Engineer at Arco (1950-1953) for plant construction and start-up.

1947-1949 Associate Engineer, Oak Ridge National Laboratory - Reported to Section Chief, Reactor Division

- 1 Designed, constructed, and started up the first Uranium-233, protactinium, irradiated thorium solvent extraction facility.
- 2 Designed and constructed Uranyl Ammonium Phosphate pilot facility for irradiated uranium.

1946-1947 Junior Engineer, Clinton Laboratories, Technical Division, Oak Ridge, Tennessee - Reported to Section Chief, Reactor Division

Engaged in semi-works operation and bench testing of solvent extraction processes for Uranium-233 and plutonium.

1945-1946 U S Army, Manhattan District, Clinton Laboratories, Oak Ridge, Tennessee - Reported to Section Chief, Chemistry Division

Engaged in chemical separations production of radioactive lanthanum and uranium REDOX solvent extraction plutonium-uranium process development

1944-1945 U S. Army, Manhattan District, Linde Air Products, Tonawanda, New York - Reported to Senior Engineer

Engaged in pilot development of gaseous diffusion plant barrier sheet which was successful and went into production for fabrication at K-25 Oak Ridge